AMATEUR SATELLITE REPORT

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AMSAT® NA *Newsletter for the Amateur Radio Space Program*

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AO-10 Begins Its Emergence From Hibernation

Observation reports received around mid-April suggested AMSAT OSCAR 10 is slowly awakening from its hibernation period. AO-10 had by then passed the period of minimum solar power by about two weeks. According to AMSAT Vice President of Operations Ralph Wallio, WØRPK, the AO-10 general beacon was monitored on Thursday, April 9. The beacon had been silent for several weeks as the period of minimum power approached and then passed. The minimum occurred on about March 30 according to analyses provided by G3RUH and N4HY. Hopefully as you read this, AO-10 will have been returned to service.

AO-10 was heard as it approached perigee at MA 236 at a range of 11,500 km. The signal was spin modulated constant carrier with peaks approximately one S-unit above the noise. According to G3RUH, the spacecraft should still have been in sunlight (but approaching an eclipse starting at MA 248) with approximately 20% solar illumination. G3RUH further predicts that illumination will improve to 28% on April 13th, 39% on April 20th and 50% on April 27th.

Day-to-day observations of signal strength at perigee should now show significant improvements. Please do not uplink to the transponder until AO-10 is released for service approximately on May 1. Utilization of the transponder before adequate solar illumination and resulting power production occurs could be catastrophic to AO-10's undercharged batteries. Watch for further information in worldwide AMSAT bulletins.

Key Managers Sought

AMSAT Headquarters has announced the opening of a number of key management positions to capable volunteers. These openings reflect an urgent need to rejuvenate the organization and get new, productive people in positions where they can do the organization the most good according to AMSAT NA President Vern Riportella, WA2LQQ.

AMSAT NA says it urgently needs help in the following areas:

1. Net control stations: Primary and backup positions on various official AMSAT hf nets. At least five new Net Control Stations are needed now in various parts of the United States.

2. Director of International Relations: This individual will organize AMSAT NA's relations with its affiliated societies.

3. Director of Advertising: To design, organize, place and monitor AMSAT advertising.

4. Development Manager: To formulate and implement AMSAT's growth package into the Phase 4 era.

5. News editors and writers: For the AMSAT News Service and *Amateur Satellite Report*, to collect, write and edit current AMSAT news.

6. Orbital Data Manager: To collect, format and distribute orbital elements and related data for the AMSAT News Service.

7. Phase 4 Ways and Means Program Director: Formulate concepts and concrete plans to finance the Phase 4 Program.

8. Special Projects Manager: Special high priority, short term efforts reporting to the President.

9. Publisher: Responsible for a broad range of AMSAT publications including *ASR, AMSAT Technical Journal* and various general and special purpose publications.

10. Information Services Manager: Responsible for the collection and dissemination of current information such as news and orbital predictions as part of the AMSAT News Service and general user services information.

To apply for any of these positions, you are encouraged to provide an expression of your interest in a cover letter and a suitable resume to WA2LQQ at the following address: P.O. Box 177, Warwick, NY 10990. Please include a daytime and evening phone if possible. Suitable candidates will be contacted immediately. All letters will be acknowledged. Everyone who volunteers will be tasked though possibly not exactly in his first choice of tasks. Flexibility is an asset here!

Rip emphasizes the urgent need to get more talent on board and producing goods and services NOW. The alternative, he says, is to condition AMSAT for an inevitable decline in future years as existing resources are exhausted.

Rip says: "For several reasons, we are entering an era of higher risk. We cannot continue to count on traditional methods to solve a new order of problems. More specifically, we want to bring to fruition the most significant program ever: Phase 4. To do it will take more effort than we have ever mustered before. We absolutely must have fresh, new talent on board and up to speed in order to make this important project happen. The time to act is now. If you ever wanted to play a leadership role in what is certainly the leading edge in Amateur Radio today, step forward now and make your status as a dedicated AMSAT volunteer known. We need you now. The rewards of high-level participation more than justify the concerted effort that will be required of you to perform at the top levels of AMSAT management."

Call For Nominations

Nominations are sought for the position of AMSAT Director. AMSAT Directors are elected by the membership for a two year term. Any five current annual or life members may nominate an AMSAT member. In addition, a member society can nominate. This year there are four seats to be filled. Those Directors whose seats are up include John Browning, W6SP; John Henry, VE2VQ; Jan King, W3GEY and Harold Price, NK6K. All nominating petitions should be sent to AMSAT HQ, P.O. Box 27, Washington, D.C. 20044, to arrive not later than June 30, 1987. For the first time, official baliot materials will be included in *Amateur Satellite Report, ASR*.

AMSAT To Aid National Space Society With Nets

AMSAT has been asked to help the newly organized National Space Society (NSS) establish an organizational communication infrastructure to aid its members stay informed on space activities and significant space news items. NSS is the new organization formed from the recent merger of the L5 Society and the National Space Institute. According to NSS official Greg Barr, NSS seeks the assistance of Radio Amateurs nationwide in relaying organizational bulletins much as AMSAT does with its AMSAT News Service (ANS).

The general framework of a plan was discussed recently at the NSS Space Development Conference in Pittsburgh. There NSS Denver-area leader Laurie Wiggins explained the objectives to interested NSS and AMSAT members. Attending were about 300 NSS members including AMSAT member Howard Zisserman, WA3GOV, and others.

NSS plans to have one of its licensed Amateur members originate a net. They seek other Amateurs, preferably AMSAT members around the nation, to receive the net and provide redistribution to NSS members. The redistribution could be in the form of a real-time relay through a repeater or via an audio recording. Non-licensed NSS members could listen to the net on hf as well as the repeater relays along with the licensed Amateurs who are also NSS members.

To volunteer to help in the NSS Net Project, simply send your name, call, address and telephone number to AMSAT HQ. Then standby to support the NSS when asked to help with communications services. Like AMSAT, NSS is a non-profit corporation and likewise seeks to promote space activity. Write to AMSAT, P.O. Box 27, Washington, D.C. 20044.

NSS and AMSAT are teamed in a number of efforts including the Phase 4 campaign.

AMSAT Technical Journal Goes to Press

AMSAT Technical Journal Editor Bob Diersing says the Technical Journal will soon go to press. Papers included in the ATJ at press time include:

An Analysis of UoSAT-2 DCE Memory Performance by Jeff W. Ward, GØK8KA, Research Fellow, UoSAT Spacecraft Engineering Research Unit, University of Surrey, Guildford, Surrey GU2 5XH

ABSTRACT — The Digital Communications Experiment payload on UoSAT-2 (OSCAR-11) was designed to provide both a facility for Amateur Radio digital communications and a test vehicle for the hardware and software necessary for large-scale store-and-forward satellite communications. The hardware is being monitored for permanent memory failures, temporary memory upsets and long-term changes in power consumption. This paper presents data gathered during 1985 and 1986 along with some preliminary conclusions drawn from that data.

A Proposed Series of Satellites for Digital Message Relay by Gerry Creager, N5JXS, 2601 S. Braeswood No. 801, Houston, Texas 77025

ABSTRACT — Explosive growth in Amateur Radio's use of digital communications has occurred since the implementation of AX.25, an adaptation of the CCITT X.25 switched packet network protocol. We propose to promote interest in the Amateur Radio satellite program by implementing a series of orbiting satellites dedicated to digital communications. Central to our concept are the following: to maximize the user base by designing the system for use by a prototypical Mode B station; and minimize the amount of modification expected on otherwise usable Packet radio equipment by adhering to the existing AX.25 protocol implementations regarding data encoding, data rates and modem access.

Power Budget and Eclipse Considerations for PTSE-H by Courtney Duncan, N5BF, 14131 Prestonwood Forest Drive, Houston, TX 77070

ABSTRACT — Power requirements and power availability for a phase I PTSE-H mission are studied. Estimates of subsystem consumption for various operational and user loading cases are considered. Estimates are made of power available for the satellite configuration and orbit considering eclipsing, orientation, and stabilization. An orbit of 800 Km altitude and 57 degrees inclination is considered primarily, other orbits are discussed for comparison. Comparisons are made between required and available power and mission management guidelines are suggested. Further study and refinement of estimates employed in this study is recommended.

Satellite Telemetry Interface for 400 Bits/s by Karl Meinzer, DJ4ZC H. Moelleken, DL3AH and R. Verroen (Reprinted from *AMSAT-DL Journal*, Vol. 13, No. 2) (Translated by D. Moe, DJØHC/KE6MN)

ABSTRACT — This article describes the operation of a circuit developed by AMSAT-DL to receive the 400 bit/s telemetry data sent by OSCAR-10 and the packet radio data to be sent by RUDAK after its launch towards the end of the year.

Alignment of the AFREG Board by Heinz Moelleken, DL3AH, (Reprinted from *AMSAT-DL Journal*, Vol. 13, No. 3) (Translated by Don Moe, DJØHC/KE6MN)

ABSTRACT — As a follow up to the description of the AFREG circuit operation this article deals with the practical portion — alignment. A few additional changes have been made in the circuit and component numbers have been assigned. This should describe the final production version.

A Non-Cosmetic Improvement to the W3IWI Tracking Algorithm by Robert W. McGwier, N4HY

ABSTRACT — Theoretical development is given for an algorithm for a major improvement in search times for AOS times when given the Keplerian elements of a satellite, and the latitude, longitude, and height above sea level of a ground station. Elementary differential calculus and analytic geometry together with a Keplerian description of orbital dynamics are combined to derive a closed-form solution to the problem of finding AOS and LOS times in eccentric anomaly rather than directly in time. This eliminates the expense of solving Kepler's equation at each step in computing

the items of interest. A future article will describe the work on the implementation of the algorithm.

N5AHD adds that a few additional papers may be included at the last minute if the authors get their materials in soon. Reservations for the first ATJ are now being accepted at AMSAT HQ. Call 301-589-6062. A limited number of copies will be printed. Get your reservation in today. Approximate cost of this historic document will be in the $12 range.

Ariane V-19 Third Stage Damaged In Vacuum Chamber Handling Incident

Efforts by the European Space Agency to get its troubled Ariane program back on track suffered another setback recently. A complete redesign of the third stage engine ignitor system had been directed following last year's loss of the V-18 mission. Tests of the ignitor were completed a few weeks ago. Efforts were then focused on flight qualification test of the V-19 mission's third stage engine. The tests had been going well until the engine was damaged in a vacuum chamber handling incident. The V-20 third stage will now be brought forward to be tested and mated to the V-19 mission.

The third stage is manufactured by SEP of France. The tests were at SEP's facility at Vernon. This is the same location where 6 individuals were recently arrested by French agents on suspicion of spying for the Soviet Union. The object of the spying was thought to be the HM7B cryogenic third stage engine built by SEP. The stage is probably the most advanced in the world despite its current difficulties.

AMSAT is uncertain what effect the mishandling incident will have on its launch prospects. There are just too many factors in flux to be able to determine what the result will be AMSAT officials commented. At present an early 1988 launch of AMSAT's Phase 3C satellite aboard an Ariane 4 launcher seems the best guess AMSAT officials have suggested.

Satellite Packet Experiments Reported

Experiments are now being conducted to link packet radio stations in the United States via a high-speed digital link from coast-to-coast. W3IWI reports a full-time satellite-linked packet channel is being used for relaying packets between the Washington D.C. and San Francisco areas. The western terminus is at Stanford University (WB6FFC-1) and the eastern terminus is at the University of Maryland (WA3YMH-1). Both ends of the link are operating on 145.01 MHz in their respective areas. Both ends of the path are "beta" test sites for the new W6IXU/WA8DED NET/ROM code which runs in stock TNC-2's. The two sites are interlinked at 9600 baud (running over a 56 kbaud full-duplex satellite link). The NET/ROM code provides level 3 and 4 linking services and ties the East Coast to the W6AMT-x network serving all of California.

Progress On Packet Radio Experiments In Africa

Packet radio experiments and a PACSAT-type satellite were suggested late last year as possible means of solving communications problems in the farming sector of the small African kingdom of Lesotho. With FO-12 soon to be offering packet store and forward facilities and the development of the Housat packet satellite system taking shape, plans are firming for early experiments.

Following the earlier news item on AMSAT bulletins and in *ASR*, a number of organizations involved in providing funding for technical projects in Third World countries have expressed interest in providing the necessary financial resources. George Hunt 7P8DL (ex VE3NGH) returned from a visit to the U.S. and Canada recently and met with SA AMSAT President Hans van de Groenendaal, ZS6AKV, to discuss the next phase in the project.

Within the next few weeks 7P8DL will be setting up a packet station on hf (3710 kHz) using an AEA PK-232 and will keep regular skeds with ZS6AKV. The purpose of this exercise is to interest a few local electronic and computer hobbyists to take up Amateur Radio and for local Lesotho Radio Amateurs to get experience in packet radio.

During the next few months an FO-12 station with packet facilities will be set up to test and demonstrate the use of satellites. To improve communications and to give Lesotho stations access to the SA AMSAT Packet Bulletin Board system, two new digipeaters are being considered. Currently, there is some uncertainty about how to obtain the necessary TNC's to set up the digipeaters. Suitable radio equipment and digipeater sites have already been identified.

A DCE link-up with the UoSAT satellites in Johannesburg is being worked on. Recently, Dr. Martin Sweeting of the University of Surrey agreed that SA AMSAT would soon be included in the DCE network. At this stage it looks as if both the Maseru-Johannesburg packet link and the DCE set-up could be operational before the end of this year, giving Lesotho stations direct access for the first time.

More Modules to Dock With Mir Space Station Soon

The Soviet Union has launched the first in a series of major new unmanned modules which will be docked with the manned space station, Mir. Launch took place on Tuesday, March 31 probably from the Soviet Central Asia launch site at Tyuratam. Rendezvous and docking of the new module was attempted on Sunday, April 5 but failed. The docking was aborted when a malfunction occurred with the module some 200 meters away from Mir.

Cosmonauts Yuri Romanenko and Alexander Laveikin, who began their mission last February 6, went for a space walk on Saturday, April 11, to inspect the new module and try to determine the nature of the problem which halted the docking process. [Preliminary reports available at press time suggested the docking took place on April 12 as a consequence of the Cosmonauts intervention during their spacewalk.]

The 11-ton module, called the Kvant, was blasted into orbit by a Proton booster rocket, the Soviet Tass news agency said. It was described as being 4 meters in diameter and 6 meters long. The two cosmonauts aboard the Mir space station will use the equipment for astrophysical observations and other studies the Soviet news agency added. It did not describe the experiments. Equipment carried by the Kvant includes a special international orbital observatory called Roentgen, Tass said. It said the observatory includes three special telescopes and was developed by Soviet scientists in cooperation with colleagues from Britain, the Netherlands, West Germany and the European Space Agency.

Also aboard are an automated plant for experiments into biotechnology (BIOS), a laboratory bay with research equipment, an on-board control system; radio, telephone and telegraph communications systems; life-support systems, and television equipment, Tass said. The BIOS experiment is designed to test food supplies suitable for use on deep space missions. Earlier this month, an unmanned rocket brought a crystal-growing machine to the

Mir space platform. Tass said the crystallizer could serve as the basis for creating an industrial shop in zero-gravity conditions. The crystallizer machine is called the KORUND (Carborundum) furnace. Also aboard is the is the PION-M a zero-g processing unit. The PION-M is being used to investigate the process of heat and mass transfer in a liquid. The Soviets have announced that some crystals grow 10 times faster in in zero-G and are of superior quality when compared to terrestrial equivalents.

In related developments, the solar cells used in conjunction with the space station are said to be largely Gallium Arsenide with power yields up to one third greater than conventional silicon cells. Power density obtained is said to be in the vicinity of 120 watts per square meter at start of life.

Watch for an hf beacon possibly on 19.954 MHz. With the size of the Mir complex now growing to include the Mir, the TM-2 cargo vessel and KVANT, the ensemble should present spectacular viewing under appropriate pre-dawn or post-dusk lighting conditions.

Short Bursts

• As has been the custom of recent years, international AMSAT nets will maintain their UTC scheduled time when the U.S.A. goes to Daylight Savings Time on April 5. This is 3 weeks earlier than in previous years. Local and regional nets will maintain their schedule in terms of local time, however. That is, for example, a local net formerly beginning at 20:00 Eastern Standard Time will henceforth be heard at 20:00 Eastern Daylight Time.

• The Phase 4 meeting in Boulder in early April was a success with nearly 30 key planners and engineers attending the historic initial design review. Among the attendees was Astronaut Dr. Tony England, WØORE. Tony is NASA's Chief Scientist on the Space Station program. He is co-leader of a joint AMSAT-ARRL project called Space Station Amateur Radio (SSAR) which aims to integrate Amateur Radio resources in the Space Station baseline design. Several National Space Society members also attended.

• AMSAT Headquarters encourages all members to renew promptly to avoid missing out on any of the current and planned programs and features planned for the next several months.

• Testing of FO-12 continues with no regular operating schedule announced by JARL or JAMSAT. Unofficially AMSAT has been told that testing of the mailbox software could begin in earnest during May but that delays have slipped full spacecraft operations.

• Advance reservations for the TAPR FO-12 modem are now being taken. You may contact Chris at the TAPR office (602) 746-1166 Tuesday-Friday or write to TAPR at: Tucson Amateur Packet Radio Box 22888 Tucson, AZ 85734

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SPECIAL ANNOUNCEMENT

As of May 30, all foreign AMSAT Life Members will receive *ASR* via other channels unless additional funds for Air Mail postage is submitted. The cost for the balance of 1987 is $10.

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